Chapter 2

Airport Development

2.1 Airport Capacity Design Teams

The data in the previous chapter indicate that delay increased slightly in 1990 over the previous year. Forecasts indicate that, absent of any capacity improvements, delay will increase substantially over the next decade.

Delay increased slightly between 1989 and 1990 and will increase substantially over the next decade without capacity improvements.

These delays are generally attributable to one or more of several conditions which include weather, traffic volume, restricted runway capability, and NAS equipment limitations. Each of these factors can affect individual airports to varying degrees, but much delay could be eliminated if the specific delay causes were identified and resources applied to reduce the delay impact deficiency.

Since 1985, the FAA has co-sponsored airport capacity design teams at delay-impacted airports across the country. Airport operators, airlines, and other aviation industry representatives work together with FAA representatives to analyze the capacity problems at each individual airport and recommend improvements that have the potential for reducing or eliminating the delay problem.

2.1.1 Airport Capacity Design Teams — Potential Savings from Improvements

The Airport Capacity Design Teams identify and assess various corrective actions which, if implemented, will increase the capacity, improve operational efficiency and reduce delay at the airports under study. These changes may include improvements to the airfield (runways, taxiways, etc.), facilities and equipment (navigation and guidance aids), and operational procedures. The capacity teams' examination of each alternative is intended to determine its technical merits. Environmental, socioeconomic, and political issues are not evaluated here but in the master planning process. Alternatives are examined with the assistance of computer simulation provided by the FAA Technical Center at Atlantic City, New Jersey. In their final report, the capacity team recommends certain projects for implementation. As can be seen from the summary of recommendations in Appendix B, the typical design team will make 20 to 30 recommendations to reduce delay at each airport. Consequently, it is virtually impossible to summarize the expected benefits of each of these recommendations in a single table. How-

ever, in many cases, the recommended improvements to the airfield represent the biggest capacity gains, particularly since they frequently incorporate the benefits of improved procedures and upgraded navigational equipment. The following table summarizes the delay savings benefits drawn from the final reports of various design teams and some current studies in progress. Delay savings are stated in millions of dollars and thousands of hours of delay saved at the highest future demand level considered by the design team. A breakdown of the summarized material and additional information is contained in Appendix E of this report.

Table 2-1 shows potential savings from airfield improvements recommended by Airport Capacity Design Teams. Figure 2-1 shows the location of Airport Capacity Design Teams in the U.S. Figure 2-2 is a three-year plan for Airport Capacity Design Teams. Table 2-2 is the status of Airport Capacity Design Teams.

The Airport Capacity Design Teams have developed more than 800 projects to increase airport capacity. New runways are being considered at more than 20 major airports as a direct result of Design Team efforts.

The status of these projects is given in Appendix B.

Airport Capacity Design Teams have developed more than 800 projects to increase airport capacity.

Table 2-1. Potential Savings from Airfield Improvements Recommended by Airport Capacity Design Teams. [1]

Airport Design Team	Major Recommended Improvements	Demand		Savings	
		Baseline	Highest	Hours (000)	Dollars ($M)
Atlanta	Fifth concourse, commuter/GA terminal and runway complex	750,000	796,500	147.0	$220.5
Charlotte	Third and fourth parallel runways	430,000	600,000	92.6	$129.7
Detroit	Two new runways	409,000	600,000	227.4	$412.9
Kansas City	Four new runways, high speed runway exits	212,000	450,000	185.8	$192.0
Memphis	New runway, taxiway extension, angled runway exit	382,000	510,000	51.5	$85.5
Miami	New taxiways, taxiway extension, improved runway exits, new holding areas	326,825	532,700	—	$41.0
Orlando	Fourth runway, new taxiways, staging areas	294,000	600,000	—	$59.6
Phoenix	New runway, new taxiways, holding area, angled exits, widened fillets	465,000	650,000	944.7	$1,020.3
St. Louis	Two new runways, taxiway extensions, angled runway exits	530,000	740,000	2,227.0	$3,294.0
Salt Lake City	New runway, revised taxiway exits	269,600	418,000	65.8	$71.7
Seattle-Tacoma	New runway, new taxiways, high speed exits	320,000	425,000	436.4	$628.4
Washington Dulles	Two new runways	320,000	450,000	14.6	$19.9

1. The potential annual delay savings in hours and dollars shown in the table represent the sum of the estimated savings benefits of the major recommended improvements for each airport. However, the savings benefits of these individual alternatives are not necessarily additive. They have been totaled here only to give an approximation on a single page of the impact these improvements could have in reducing delay at these airports.

   It should also be noted that the particular combination of computer models and analytic methods used to calculate the annual delay costs and benefits is unique to each airport. Therefore, it is difficult, if not impossible, to compare one airport to another.

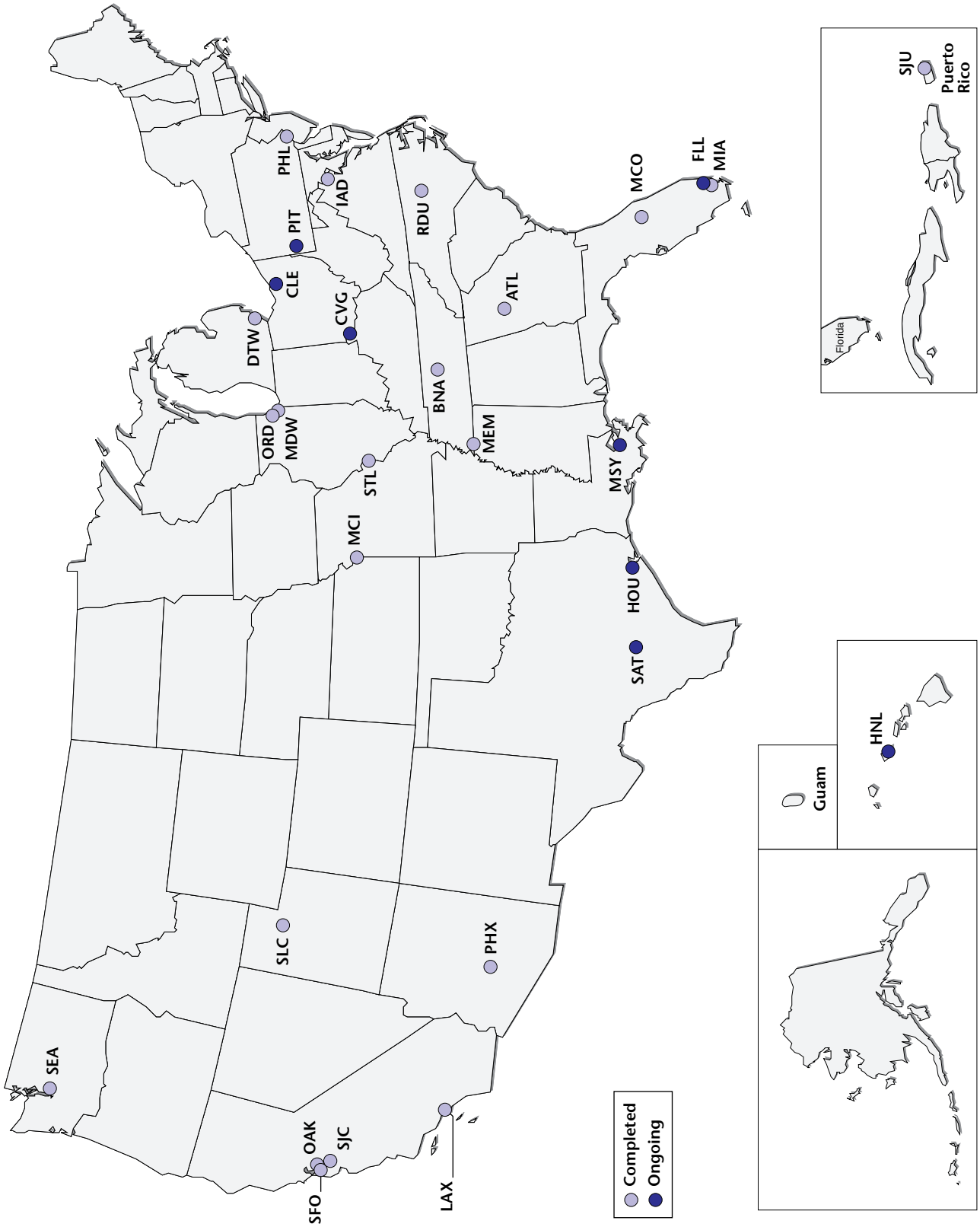

Figure 2-1. Location of Airport Capacity Design Teams in the U.S.

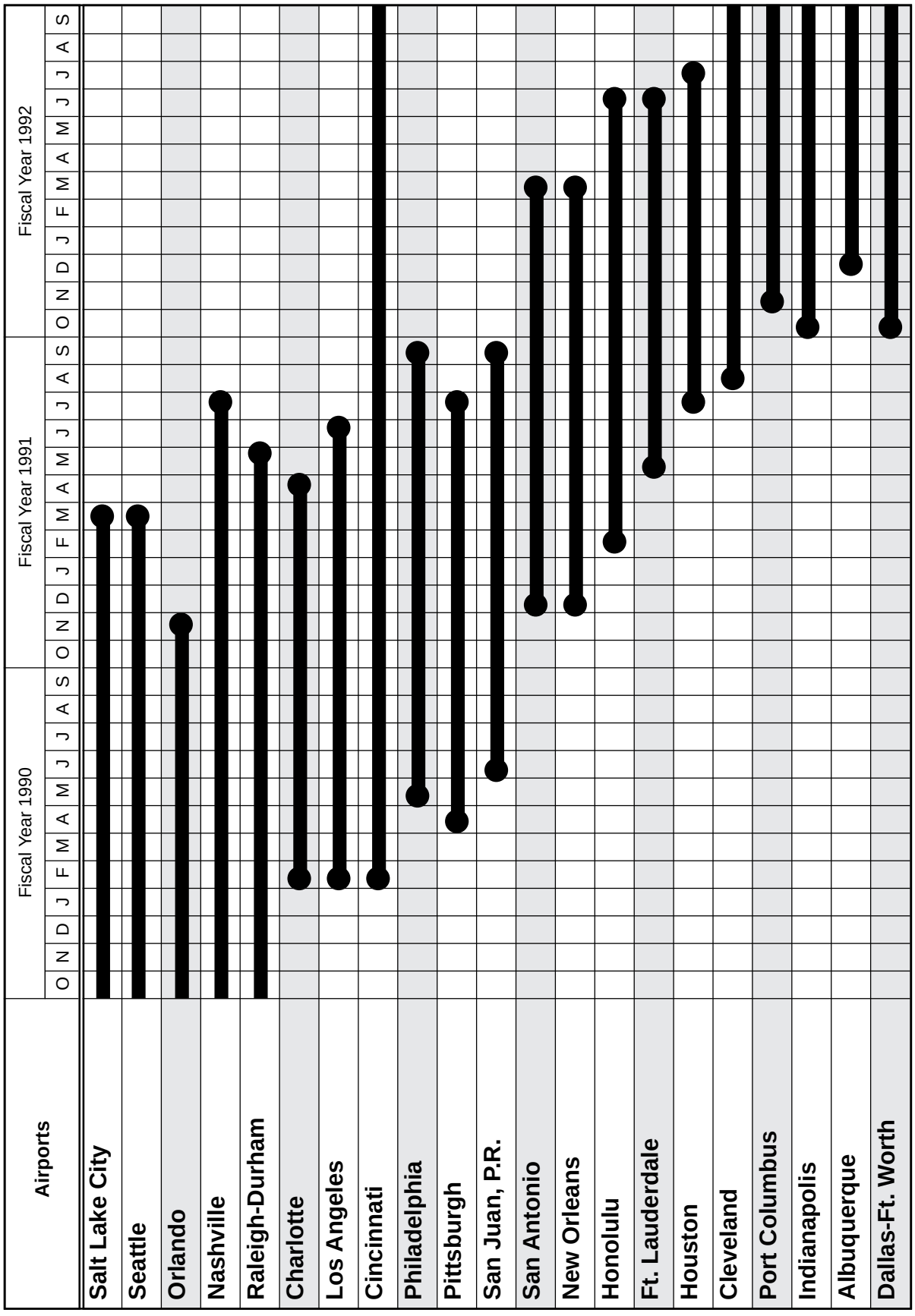

Figure 2-2. Three Year Plan for Airport Capacity Design Teams.

Table 2-2. Status of Airport Capacity Design Teams. [2]

Airport Capacity Design Team Status		
Completed		**Ongoing**
Atlanta	Philadelphia	Cincinnati
Charlotte	Phoenix	Cleveland*
Chicago	Raleigh-Durham	Fort Lauderdale*
Detroit	Salt Lake City	Honolulu*
Kansas City	San Francisco	Houston*
Los Angeles	San Juan, P.R.	New Orleans*
Memphis	San Jose	Pittsburgh
Miami	Seattle	San Antonio*
Nashville	St. Louis	
Oakland	Washington-Dulles	
Orlando		

* Projects recently initiated

2. Airport Capacity Design Status as of 10-31-91.

2.2 New Construction — New Airports and New and Extended Runways

The construction of new airports, as well as new runways and extensions of existing runways, are the most direct and significant actions that can be taken to improve airport capacity. Large capacity increases, both under Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) conditions, come from the addition of new runways that are properly placed to allow additional independent arrival and/or departure streams. The resulting increase in capacity is from 33% to 100% (depending on whether the baseline is a single, dual, or triple runway configuration.)

Sixty-two of the top 100 airports have proposed new runways or runway extensions to increase airport capacity.[3]

Eighteen of the 23 airports exceeding 20,000 hours of air carrier flight delay in 1990[4] are in the process of constructing or planning the construction of new runways or extensions of existing runways.

Of the 40 airports that are forecast to exceed 20,000 hours of annual air carrier delay in 2000, if no further improvements are made, 29 propose to build new runways or runway extensions.[5]

The total anticipated cost of completing these new runways and runway extensions exceeds $6.5 billion. The proposed projects are in various stages of development. Of the 109 known projects, 77 are shown on an approved airport layout plan (ALP), 26 are known to have completed an environmental impact statement (EIS), 15 are known to have completed an application for an Airport Improvement Program (AIP) grant, and 14 have already begun construction.[6]

New parallel runways were put into service at Cincinnati, Indianapolis, Las Vegas, and Little Rock in 1990 and early 1991. All runway extensions at Baltimore-Washington also became operational in 1990, and a runway at Cleveland was reconstructed. Figure 2-3 shows which of the top 100 airports are planning new runways. Figure 2-4 shows which of the airports forecasted to exceed 20,000 hours of annual delay in 2000 are planning new runways. Table 2-3 shows new and extended runways that are planned or proposed.

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Eighteen of the 23 airports exceeding 20,000 hours of air carrier flight delay in 1990 are in the process of constructing or planning the construction of new runways or extensions of existing runways.

3. The airports having runway projects are pictured in Figure 2-3 and summarized in Table 2-3, on page 2-10, with the projected IFR capacity benefit, the estimated project cost (to the nearest million), and an estimated operational date. Although the single figure of IFR capacity benefit does not reflect all the many significant capacity benefits resulting from this new construction, it is provided as a common benchmark.
4. 20,000 hours of flight delay translates into over $32 million per year at the cost of $1600 per hour of airport delay.
5. As reflected in Figure 2-4, on page 2-9.
6. As reflected in Appendix C.

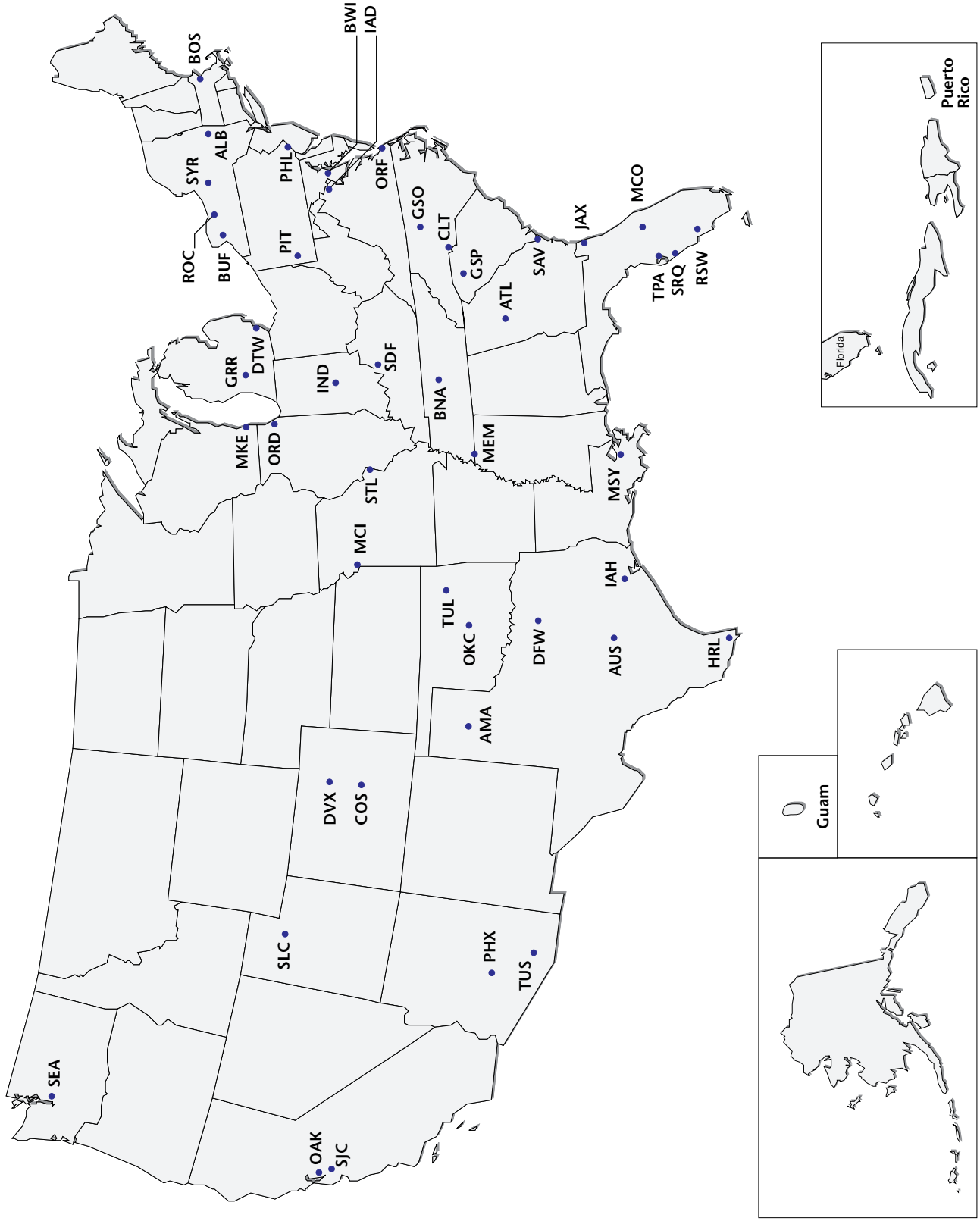

Figure 2-3. New Runways Planned or Proposed Among the Top 100 Airports.

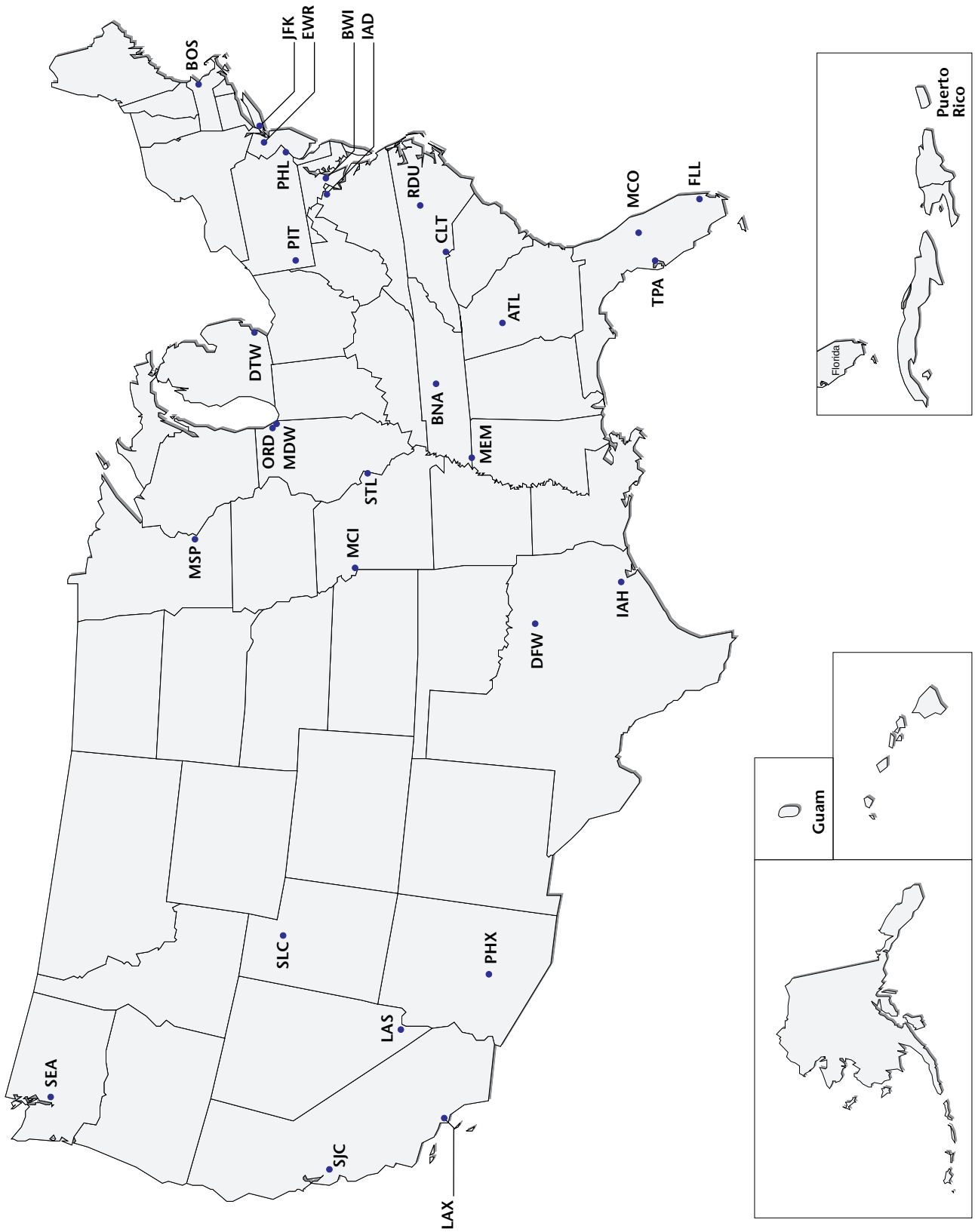

Figure 2-4. New Runways or Extensions Planned/Proposed Among Airports Forecasted to Exceed 20,000 Hours of Annual Aircraft Delay in 2000

Table 2-3. New and Extended Runways Planned or Proposed+

Airport	Runway	IFR Capacity (ARR/HR)† New Config.	IFR Capacity (ARR/HR)† Current Best	Est. Cost ($M)	Est. Date Oper.
Albuquerque (ABQ)	3/21 extension	26[2]	26[2]	$11	1991
Albany (ALB)	10/28 extension	26[2]	26[2]	$2	1997
	1R/19L parallel	++	26[2]	$15	1999
Amarillo (AMA)	13/31 extension	++			1997
Atlanta (ATL)	E/W parallel	63[6]	52[1]	$130	1995
Austin New Airport (AUS)[12]	Parallels — 17/35	52[1]	26[2]	$550*	1997
Baltimore (BWI)	10R/28L	52[11]	26[2]	$38	1996
Birmingham (BHM)	18/36 extension	26[2]	26[2]	$43	1996
Boston (BOS)	14/32	36[4]	26[2]		
	15L extension	26[2]	26[2]		
Buffalo (BUF)	5L/23R	26[2,8]	26[2,8]		1999
	14/32 extension	26[2,8]	26[2,8]	$4	1993
Charlotte (CLT)	18L/36R extension	52[7,8]	52[1,2]	$7	1993
	18/36 parallel	78[3,10]	52[1,8]	$17	1996
Chicago Midway (MDW)	22L extension	26[2]	26[2]	$8	1991
Chicago O'Hare (ORD)	9/27	78[3]	52[1]		
	14/32	78[3]	52[1]		
Colorado Springs (COS)	17L/35R	52[1]	26[2]	$38	1992
Columbus (CMH)	10L extension	52[7]	36[4]	$8	1995
	28R extension	52[7]	36[4]	$3	1994
Dallas-Fort Worth (DFW)	17R/35L extension	52[1]	52[1]	$24	1991
	18L/36R extension	52[1]	52[1]	$24	1993
Dallas-Fort Worth (DFW)	16L/34R	78[3]	52[1]	$100	1993
	16R/34L	78[3,10]	52[1]	$95	1997
Denver New (DVX)[12]	New Airport	78[3,10]	52[1]	$2,500**	1993
Detroit (DTW)	9R/27L	52[1]	52[1]	$69	1992
	4/22 parallel	63[6]	52[1]	$58	1995
Fort Lauderdale (FLL)	9R/27L extension	52[1]	26[2]	$26	1995
Fort Myers (RSW)	6/24 extension	26[2]	26[2]	$10	1992
	6R/24L parallel	52[1]	26[2]	$120	1999

+ See endnotes 1-11, on page 2-13, which describe the IFR arrival capacity of the current and potential new configurations.

* Cost for New Airport (Phase I) land, terminal, runways, etc.

** Cost for New Airport Phase I.

Table 2-3. New and Extended Runways Planned or Proposed (continued)+

Airport	Runway	IFR Capacity (ARR/HR)† New Config.	IFR Capacity (ARR/HR)† Current Best	Est. Cost ($M)	Est. Date Oper.
Grand Rapids (GRR)	8L/26R parallel	52[1]	26[2]	$25	1994
	8L/26R extension	26[2]	26[2]	$30	1995
Greensboro (GSO)	5/23 parallel	52[1]	26[2]	$20	2010
	14/32 extension	26[2]	26[2]	$14	1998
Greer (GSP)	3/21 parallel	52[1]	26[2]	$25	1995
Harlingen (HRL)	13L/31R	52[7]	26[2]	$5	1995
	13/31 extension	26[2]	26[2]	$7	1995
Houston (IAH)	8L/26R	78[3]	52[1]	$44	1999
	9R/27L	52[1]	52[1]	$44	2002
	14R/32L extension	52[1]	52[1]	$8	1997
Indianapolis (IND)	5L/23R replacement	36[4]	36[4]	$42	1996
Islip (ISP)	8/24 extension	26[2]	26[2]		
Jacksonville (JAX)	7R/25L parallel	52[1]	26[2]	$37	
Kansas City (MCI)	1R/19L	52[1]	26[2]	$46	1992
	9R/27L	26[2]	26[2]	$60	1999
	18L/36R	52[1]	26[2]	$65	1999
	18R/36L	78[3]	26[2]	$90	1999
Knoxville (TYS)	5R/23L extension	36[4]	26[2]	$17	1992
Las Vegas (LAS)	1L/19R extension	26[2]	26[2]		1997
	7R/25L	++	26[2]	$42	1991
Little Rock (LIT)	4R/22L	52[1]	26[2]	$80	1991
Los Angeles (LAX)	6L/24R extension	52[1]	52[1]	$4	1995
Louisville (SDF)	East parallel	52[1]	26[2]	$175	1995
	West parallel	52[1]	26[2]	$175	1997
Lubbock (LBB)	8/26 extension	26[2]	26[2]	$6	1995
Memphis (MEM)	18L/36R parallel	52[7]	36[4]	$105	1994
Midland (MAF)	10/28 extension	52[7]	26[2]	$6	1992
Milwaukee (MKE)	7L/25R	52[7]	26[2]	$150	2003
	1L/19R extension	26[2]	26[2]	$13	1993
Minneapolis (MSP)	4/22 extension	52[1]	36[4]	$11	1992
Nashville (BNA)	2C/20C extension	52[1]	52[1]	$34	1995
	2E/20E extension	++	52[1]		

+ See endnotes 1-11, on page 2-13, which describe the IFR arrival capacity of the current and potential new configurations.

Table 2-3. New and Extended Runways Planned or Proposed (continued)+

Airport	Runway	IFR Capacity (ARR/HR)† New Config.	IFR Capacity (ARR/HR)† Current Best	Est. Cost ($M)	Est. Date Oper.
New Orleans (MSY)	1/19 parallel	52[1]	26[2]	$180	2000
	10/28 parallel	52[1]	26[2]	$40	1995
	10/28 extension	26[2]	26[2]	$10	1991
New York Kennedy (JFK)	4L/22R extension	52[7]	36[4]		
Newark (EWR)	11/29 extension	52[7]	26[2]		
Norfolk (ORF)	5R/23L	26[2]	26[2]	$13	1994
	14/32 extension	26[2]	26[2]	$2	1996
Oakland (OAK)	11R/29L	++	26[2]	$143	
Oklahoma City (OKC)	17L/35R extension	52[1]	52[1]	$24	2001
	17R/35L extension	52[1]	52[1]	$20	2001
	17/35 parallel	52[1]	52[1]	$55	2001
Orlando (MCO)	17L/35R 4th parallel	78[3]	52[1]	$80	1993
Philadelphia (PHL)	8/26 parallel-commuter	52[1]	52[7]	$169	
	17/35 extension				
	relocate 9L/27R	52[1]	52[7]	$55	1997
Phoenix (PHX)	8S/26S 3rd parallel	52[1]	26[2]	$88	1994
Pittsburgh (PIT)	10C/28C extension	52[1]	52[1]	$10	1995
	4th parallel 10/28	78[3]	52[1]	$100	1995
	14R/32L		52[1]	$100	1995
Raleigh-Durham (RDU)	relocate 5R/23L	63[6]	36[4]	$45	1996
Rochester (ROC)	4R/22L parallel	++	26[2]	$5	2000
	4/22 extension	52[7]	26[2]	$1	1996
	10/28 extension	52[7]	26[2]	$2	1994
Salt Lake City (SLC)	16/34 west parallel	63[6]	36[4]	$95	1994
San Jose (SJC)	30R/12L extension	26[2]	26[2]	$10	
Sarasota-Bradenton (SRQ)	14L/32R parallel	26[2]	26[2]		
Savannah (SAV)	9L/27R parallel	52[1]	26[2]	$20	2010
	18/36 extension	26[2]	26[2]	$4	1995
Seattle-Tacoma (SEA)	16/34 west parallel	36[4]	26[2]		
Spokane (GEG)	3L/21R	52[1]	26[2]	$11	1996
St. Louis (STL)	13/31	52[7]	26[2]	$1	

+ See endnotes 1-11, on page 2-13, which describe the IFR arrival capacity of the current and potential new configurations.

Table 2-3. New and Extended Runways Planned or Proposed (concluded)+

Airport	Runway	IFR Capacity (ARR/HR)† New Config.	IFR Capacity (ARR/HR)† Current Best	Est. Cost ($M)	Est. Date Oper.
Syracuse (SYR)	10L/28R	52[1]	26[2]	$5	1997
Tampa (TPA)	18R/36L 3rd parallel	52[1]	52[1]	$53	1997
Tucson (TUS)	11R/29L parallel	26[2]	26[2]	$143	1995
Tulsa (TUL)	17/35 parallel	78[3]	52[1]	$100	1998
Washington (IAD)	1W/19W parallel	78[3]	52[1]	$60	2000
	12/30 parallel	52[1]	52[1]		
	12/30 extension	52[1]	52[1]	$7	1992
West Palm Beach (PBI)	9L/27R extension	26[2]	26[2]	$4	1994

Total Available Estimated Costs of Construction: $6.4 Billion*

\+ See endnotes 1-11, below, which describe the IFR arrival capacity of the current and potential new configurations.

++ Information on runway location is unavailable or too tentative to determine IFR multiple approach benefit of this new construction project.

* Includes the total costs of the New Austin airport and the New Denver airport, $550 million and $2,500 million, respectively. Does not include the cost of projects completed in 1989.

† Estimates of generalized hourly IFR arrival capacity increases are included in Table 2-3. Based on a 1987 report, the IFR arrival capacity of any single runway that can be operated independently is 26 arrivals/hour; a dependent parallel pair, 36 arrivals/hour; and independent parallels, 52 (2 x a single runway) arrivals/hour. Other configurations are multiples of the above. These values are provided to illustrate the approximate magnitude of the capacity increase provided. They should not be taken as the exact capacity of a particular airport since site-specific conditions (e.g., varying fleet mixes) can result in differences from these estimates.

Endnotes

1. Independent parallel approaches [52 IFR arrivals per hour].
2. Single runway approaches [26 IFR arrivals per hour].
3. Triple approaches (currently not authorized) [78 IFR arrivals per hour].
4. Dependent parallel approaches [36 IFR arrivals per hour].
5. Triple approaches with parallel and converging pairs may permit more than 52 IFR arrivals if procedures are developed.
6. Triple parallel approaches with dependent and independent pairs (currently not authorized) [63 IFR arrivals per hour].
7. Converging IFR approaches to minima higher than category (CAT) I ILS [52 IFR arrivals per hour].
8. Added capacity during noise abatement operations.
9. Independent parallel approaches with one short runway.
10. If independent quadruple approaches are approved [104 IFR arrivals per hour].
11. Independent parallel approaches (3,400 to 4,300 ft.) [52 IFR arrivals per hour].

2.3 Civilian Use of Military Airfield Capacity

As indicated in Table 2-3, new airports or new runways or runway extensions at existing airports, offer the greatest potential for increasing airport capacity. One element in providing such capacity is the possible redistribution of some commercial and general aviation traffic to new or enhanced reliever or satellite airports.

The ability to develop new airports has become increasingly difficult in recent years. A combination of community opposition, competing residential and commercial interests, environmental concerns, and cost factors have significantly constrained development of new airports and, in some cases, expansion of existing facilities.

The ability to develop new airports has become increasingly difficult in recent years. As part of its overall strategy for capacity enhancement, the FAA is pursuing an initiative (the Military Airport Program (MAP)) for the implementation of joint-use of existing military airfields and/or adaptation of former military facilities to civilian use.

As part of its overall strategy for capacity enhancement, the FAA is pursuing an initiative for the implementation of joint-use of existing military airfields and/or adaptation of former military facilities to civilian use. This initiative, the Military Airport Program (MAP), provides for the designation of current or former military airfields by the Secretary of Transportation for participation in MAP. Parties wishing to participate apply to the FAA for designation of the particular facility. In determining whether or not to designate a facility, the FAA may consider (1) proximity to major metropolitan air carrier airports with current or projected high levels of air carrier delay; (2) capacity of existing airspace and traffic flow patterns in the metropolitan area; (3) the availability of local sponsors for civil development; (4) existing levels of operation; and (5) existing facilities as well as any other appropriate factors.

The current 20 joint-use facilities have had a modest impact on system capacity. Examples of such facilities are Dillingham Army Airfield, Hawaii, and Rickenbacker Air National Guard Base, Columbus, Ohio. These facilities provide congestion relief to the airports at Honolulu and Port Columbus respectively, both projected to exceed 20,000 hours of air carrier delay before the end of the decade without further improvements.

Currently two former military airports have been designated by the Secretary for participation in MAP. These are the former Stewart Air Force Base near Newburgh, NY, and the former Ellington Air Force Base at Houston, TX.

A recent General Accounting Office (GAO) report on MAP observed that for a joint-use facility to have major impact it must be located in a major metropolitan area and near enough to a congested airport so as to be a reasonable alternative. The airfield should be in demand by either commercial or general aviation which are not adequately served by an uncongested airport in the area and the military host should not limit civilian demand. The use of existing and former joint-use airfields is not a panacea for aviation system capacity problems but is an integral component in the FAA's strategy to maximize the safe utilization of the nation's air capacity system.